

## Patent claims

1. A method for producing a complete three-dimensional  
molded body layer by layer from at least two  
5 partial quantities (7, 10, 52) in the form of  
layers of at least a first starting material,  
which produce the complete molded body,  
the starting material (7, 10, 52) being melted and  
directionally solidified,  
10 a starting plate (4) with a specific crystalline  
structure  
which predetermines the crystalline structure for  
the three-dimensional molded body being used,  
so that the compaction takes place by a directional  
15 solidification by means of epitaxial growth,  
whereby the partial quantities (7, 10, 52) of the  
at least one starting material are bonded together.
2. The method as claimed in claim 1,  
20 characterized in that  
  
a compaction treatment is carried out with at least  
one of the partial quantities (7, 10, 52).
- 25 3. The method as claimed in claim 2,  
characterized in that  
  
a thermal compaction treatment is carried out.
- 30 4. The method as claimed in claim 1,  
characterized in that  
  
a laser is used to bond the partial quantities (7,  
10, 52) together.

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5. The method as claimed in claim 2 or 3,  
characterized in that

a laser (16) is used for the compaction treatment.

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6. The method as claimed in claim 1,  
characterized in that

a powder compact or a metal sheet or a metal foil  
is used as the partial quantity (7, 10).

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7. The method as claimed in claim 1,  
characterized in that

a three-dimensional molded body with grain  
boundaries is formed by the directional  
solidification, the grain boundaries running only  
in one direction (25).

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8. The method as claimed in claim 1,  
characterized in that

a monocrystalline three-dimensional molded body is  
formed by the directional solidification.

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9. The method as claimed in claim 1,  
characterized in that

the three-dimensional molded body is produced in  
such a way that it has a material gradient.

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10. The method as claimed in claim 9,  
characterized in that

5 at least one of the partial quantities (7, 10, 52)  
has a material gradient.

11. The method as claimed in claim 9,  
characterized

10 in that at least one material supply (46, 49) is  
used to supply material for the molded body, and in  
that the material gradient is produced by  
controlling the material supplies (46, 49) in terms  
of time and/or location.

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12. The method as claimed in claim 9 or 11,  
characterized

20 in that at least one material supply (46, 49) for  
the supply of partial quantities (7, 10, 52) of at  
least one starting material is used, and  
in that starting material is supplied by the at  
least one material supply (46, 49) during a  
specific time period,

25 the material composition of the starting material  
which is supplied by the at least one material  
supply (46, 49) changing during this time period,  
so that a material gradient is created in the  
partial quantities (7, 10, 52).

13. The method as claimed in claim 9 or 11,  
characterized in that

5 partial quantities (7, 10, 52) for the starting  
material are supplied by at least two material  
supplies (46, 49),  
the first material supply (46) supplying a first  
material composition and  
10 the second material supply (49) supplying a second  
material composition,  
and the two material supplies (46, 49) supplying  
respective material at different locations,  
so that a material gradient is created in the  
partial quantities (7, 10, 52).

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14. The method as claimed in claim 4 or 5,  
characterized in that

20 the geometry of the three-dimensional moulded body  
to be produced is fixed by a movement of the laser  
beams (13) of the laser (16) over the partial  
quantities (7, 10, 52).

- 25 15. The method as claimed in claim 1,  
characterized in that

an additional heater (34) is used to heat up the  
starting plate (4) and/or the starting material (7,  
10, 52) or to keep it at a certain temperature.

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16. The method as claimed in claim 1,  
characterized in that
- the moulded body is formed only from partial  
5 quantities (7, 10, 52) in the form of layers.
17. The method as claimed in claim 1,  
characterized in that
- 10 the partial quantities (7, 10) in the form of  
layers have a thickness of from 0.1 mm to 1 cm.
18. The method as claimed in claim 1,  
characterized in that
- 15 the molded body is longer perpendicularly to a  
plane in which the partial quantities (7, 10) in  
the form of layers extend than the extent of the  
molded body in this plane.